

REMARKS

In accordance with the foregoing, claims 1, 6, 12, and 17 have been amended and claims 2, 7, 13, and 18 have been cancelled without prejudice or disclaimer. No new matter is being presented. Therefore, claims 1, 3-6, 8-12, 14-17, and 19-64 are pending and reconsideration is respectfully requested.

REJECTIONS UNDER 35 U.S.C. §102:

Claims 1-26 and 28-64 are rejected under 35 U.S.C. §102(b) as being anticipated by Lee et al (European Patent 1035423), (hereinafter referred to as the "'423 publication"). These rejections are traversed.

Regarding the rejections of claims 1, 6, 12, 17, and 23, it is noted that these claims recite that the vertical cavity surface emitting laser (VCSEL) collimates the emitted laser beam across the entire window region. As a result, a parallel laser beam is emitted from the window region. *See the specification at paragraphs [0033]-[0034].*

When the claimed VCSEL, constructed in this manner, is adopted in an optical communication system employing an optical fiber, an optical coupling between the VCSEL and the optical fiber can be sufficiently realized and there is no need for a separate ball lens for optical coupling between the light source and the optical fiber. In detail, since a single mode optical fiber has a minimum core diameter of 10 micrometers and a multiple mode optical fiber has a minimum core diameter of tens of micrometers, and since the claimed VCSEL emits a parallel laser beam of that size range, the parallel laser beam emitted from the VCSEL can be coupled with the optical fiber with high efficiency and without a need for a separate optical coupling lens.

Further, when the claimed VCSEL is applied to an optical system such as an optical head that uses a parallel light beam, there is an advantage that no collimating lens is additionally required. In addition, when the claimed VCSEL is adopted to transmit and receive an optical signal through free space, no separate condensing lens is needed and the degree of freedom of the distance between light transmitting and receiving portions increases. Thus, the optical structure is simple and optical alignment thereof is relatively easy.

In contrast, the VCSEL disclosed in the '423 publication does not emit a parallel laser beam. Rather, as shown in FIGS. 6 and 7, which are cited by the Examiner as being particularly relevant to the rejections, the laser beam emitted from the micro lens 155 is focused at a point

that is apparently not far in front of the micro lens 155. Hence, the '423 publication does not provide the advantage of not needing a separate ball lens for optical coupling between the light source and the optical fiber, or the advantage that the VCSEL can be coupled with an optical fiber without a need for a separate optical coupling lens. Further, as noted above, when the claimed VCSEL is applied to an optical system such as an optical head that uses a parallel light beam, there is no additional requirement for a collimating lens, and, when the claimed VCSEL is adopted to transmit and receive an optical signal through free space, no separate condensing lens is needed and the degree of freedom of the distance between light transmitting and receiving portions increases. The same cannot be said of the '423 publication.

In addition, it is noted that claims 1 and 12 now recite that the VCSEL satisfies the relationship: $f = R \times n1 / (n2 - n1)$, where f is a distance along an optical axis from a light generating region of the active layer to a vertex of the micro-lens, R is a radius of curvature of the micro-lens, $n1$ is an effective refractive index of a medium on an optical path between the light generating region and the lens layer, and $n2$ is a refractive index of a region towards which a light is emitted through the micro-lens. Meanwhile, claims 6 and 17 recite that the maximum width of the window region D and a focal length f of the micro-lens satisfy the relation: $D = \sqrt{2 \times 1.22 \lambda f}$, where λ is a wavelength of the laser beam emitted from the VCSEL.

With respect to the above noted features, the Examiner suggests that since the Lee teaches a structure that is equivalent to the claimed invention, it is inherent that the above-noted features would also be taught by the reference. This line of reasoning is not only improper, since it does not point out where in fact the Lee reference actually teaches the features in question, but also incorrect in view of the differences between the claimed invention and the reference which have been set forth above.

Thus, claims 1, 6, 12, 17, and 23 are believed to be patentably distinguished from the '423 publication. Therefore, the rejections of these claims are believed to be overcome.

Regarding the rejections of claims 2-5, 7-11, 13-16, 18-22, 24-26 and 28-64, it is noted that these claims depend from claims 1, 6, 12, 17, and 23, respectively, and that, therefore, the rejections of these claims are believed to be overcome for at least the reasons set forth above.

REJECTIONS UNDER 35 U.S.C. §103:

Claim 27 is rejected under 35 U.S.C. §103(a) as being unpatentable over Lee et al (European Patent 1035423). However, since claim 27 depends from claim 23, which is believed

to be allowable, as discussed above, it is noted that the rejection of claim 27 is believed to be overcome for at least the reasons set forth above.

CONCLUSION:


There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited. If there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

Finally, if there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

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